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BUREAU OF MINES MINERALS YEARBOOK

The Mineral Industry of Other East African Countries

UNITED STATES DEPARTMENT OF THE INTERIOR

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UNITED STATES DEPARTMENT OF THE INTERIOR • Manuel J. Lujan, Jr., Secretary

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The Mineral Industry of Other East African Countries

By Kevin Connor[1]

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BURUNDI

Exports of agricultural products, mostly coffee, continued to account for more than 90% of Burundi's foreign exchange revenue. The country's ban on commercial mining was lifted in 1987. Mining of peat for fuel, limestone for agriculture, and clay for insecticides continued as in previous years. At yearend, Burundi's external debt stood at almost $700 million.[2]

Amoco Burundi, a subsidiary of the Amoco Petroleum Co., drilled two exploration wells in northern Lake Tanganyika in 1987. No oil was found, but preliminary findings were encouraging enough that further seismic surveys and offshore and onshore drilling exploration were planned in 1988. Any oil or gas finds would have substantial impact on the Burundian economy because a major portion of the country's trade deficit was directly attributable to petroleum and gas imports. The Zaire Government agreed in June to let Amoco Burundi explore Zaire's side of Tanganyika using the same equipment and personnel being used in Burundi.

The Musongati nickel laterite project remained a most important mining venture but investigations were at a virtual standstill. Analyses and reports on exploration drilling in 1985-86 were offered to various governments, international lending agencies, and mining companies in hopes of generating development capital. The feasibility project consultant, Exploration und Bergbau of the German Democratic Republic, released details on the extent and content of the higher grade nickel deposits in 1986. More than 200 million tons of nickel ore had been estimated in Burundi by yearend, with a high-grade nickel zone identified at Buhinda, northeast of Musongati.[3]

Within the explored high-grade Buhinda area, reserves at a cutoff grade of 0.8% nickel were placed at 29 million tons averaging 1.62% nickel, 0.12% cobalt, and 0.31% copper. The ore also contained palladium and platinum. Approximately 46% of the ore was ferrolitic, and the rest was higher valued saprolite. Drilling evidence suggested a coherent 1,200-meter-long by 200-meter-wide mineralized zone, characterized by thick, saprolitic, high-grade nickel

ore. The shallow ore body was described to have overburden ranging from 5 to 55 meters, with an average of approximately 21 meters.

Table 1.—Other countries of East Africa: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Country and commodity		1983	1984	1985	1986[p]	1987[p]
BURUNDI[3]						
Clays: Kaolin		4,053	1,990	4,060	5,113	6,250
Gold	troy ounces	272	1,115	829	960	838
Lime		300	42	1,100	160	137
Peat		13,293	14,000	10,313	12,455	17,000
ETHIOPIA[2]						
Cement, hydraulic[e]		170,000	240,000	250,000	250,000	250,000
Clays: Kaolin[e]		9,000	9,000	9,000	9,000	9,000
Gold, mine output, Au content[e]	troy ounces	14,000	15,000	15,000	15,000	[r]20,651
Gypsum and anhydrite, crude[e]	cubic meters	4,000	4,000	4,000	4,000	900
Petroleum refinery products:[e]						
Gasoline	thousand 42-gallon barrels	[r]855	900	[r]849	850	850
Kerosene and jet fuel	do.	[r]465	500	[r]478	500	500
Distillate fuel oil	do.	[r]1,514	1,500	[r]1,149	2,100	2,100
Residual fuel oil	do.	[r]2,002	2,000	[r]1,277	1,400	1,400
Other	do.	[r]146	150	[r]122	125	125
Refinery fuel and losses	do.	[r]475	500	[r]544	550	550
Total	do.	[r]5,488	5,550	[r]5,319	5,525	5,525
Platinum, mine output, Pt content[e]	troy ounces	125	127	150	150	150
Pumice[e]	cubic meters	[r]5,625	6,000	6,000	6,000	26,042
Salt:[e]						
Rock		15,000	15,000	15,000	15,000	15,000
Marine		110,000	120,000	120,000	120,000	120,000
Stone, sand and gravel:[e]						
Limestone		100,000	100,000	100,000	100,000	125,000
Sand	cubic meters	650,000	650,000	650,000	650,000	422,601
Other		2,000,000	2,000,000	2,000,000	2,000,000	2,000,000
KENYA[2]						
Barite		300	210	255	420	50
Carbon dioxide, natural		3,000	3,161	3,151	4,000	4,386
Cement, hydraulic	thousand tons	1,280	1,164	847	1,312	1,321
Clays:						
Bentonite[e]		200	200	200	250	250
Kaolin		650	295	329	2,000	40
Diatomite		1,570	1,512	3,092	1,450	614
Dolomite[e]		[r]1,920	[r]2,865	3,000	3,000	3,000
Feldspar		700	685	492		500
Fluorspar		50,084	46,578	58,174	50,851	60,190
Gem stones, precious and semiprecious:						
Amethyst	kilograms	5	17	10	*	*
Aquamarine	do.	4	7	7	*	*
Garnet	do.	68	107	90	44	409
Ruby	do.	98	187	92	66	79
Sapphire	grams	[r]5,000	[r]5,000	[r]5,000	[r]5,000	5,000
Tourmaline	kilograms	37	13	31	5	11
Gold, mine output, Au content	troy ounces	100	600	442	2,339	[r]4,959
Gypsum and anhydrite		1,350	[r]1,500	[r]1,500	17,060	28,819
Iolite	grams	5,504	20,000	24,000	20,000	[r]20,000
Iron and steel: Steel, crude[e]		10,000	10,000	10,000	10,000	10,000
Kyanite	kilograms	5,447	1,000	1,000	1,000	1,000
Lime		34,869	20,855	27,860	12,300	26,492
Magnesite[e]		300,000	[r]311,254	300,000	300,000	300,000
Petroleum refinery products:[e]						
Gasoline, motor	thousand 42-gallon barrels	2,555	2,600	2,600	2,600	2,600
Jet fuel	do.	2,555	2,600	2,600	2,600	2,600
Distillate fuel oil	do.	3,285	3,300	3,300	3,300	3,300
Residual fuel oil	do.	4,015	4,000	4,000	4,000	4,000
Unspecified	do.	365	400	400	400	400
Refinery fuel and losses	do.	365	400	400	400	400
Total	do.	13,140	13,300	13,300	13,300	13,300
Phosphatic materials: Guano			6	6		
Salt:						
Rock		[r]60,000	72,885	66,330	65,000	[r]65,000
Other		[r]23,427	28,000	25,800	35,379	[r]35,000
Total		83,427	100,885	92,130	100,379	[r]100,000
Shale		231,069	789,484	750,000	750,000	142,428

See footnotes at end of table.

Table 1.—Other countries of East Africa: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Country and commodity	1983	1984	1985	1986[p]	1987[p]
KENYA[2] —Continued					
Sodium compounds, n.e.s.:					
Soda ash	193,690	226,050	227,760	237,650	228,650
Soda, crushed, raw	4,260	5,288	5,441	5,882	1,557
Stone, sand and gravel:					
Calcareous:					
Coral (for cement manufacture)	150,000	150,000	150,000	175,030	[e]175,000
Kunkur (for cement manufacture)[e]	200,000	200,000	230,000	250,000	250,000
Limestone (for cement manufacture)	1,579,960	1,444,234	1,333,000	2,069,020	[e]2,000,000
Sand, glass	[r]5,488	[r]5,550	5,519	5,525	[e]5,525
Vermiculite	1,200	872	1,515	2,544	3,887
Wollastonite	—	—	—	298	[e]300
LESOTHO[2]					
Stone[e] cubic meters	25,000	25,000	25,000	25,000	25,000
MALAWI[2]					
Cement, hydraulic	70,318	70,058	61,654	69,471	72,831
Coal	—	2,000	[e]4,000	10,708	18,256
Lime	2,190	2,095	1,923	2,735	3,160
Stone: Limestone	109,186	[e]100,000	[e]100,000	103,037	107,040
MAURITIUS[2]					
Lime[e]	7,000	7,000	7,000	7,000	7,000
Salt[e]	6,000	6,000	6,000	6,000	6,000
Stone: Basalt, not further described[e]	1,100,000	1,100,000	1,100,000	1,100,000	1,100,000
MOZAMBIQUE[2]					
Asbestos	[e]600	[e]400	55	—	—
Bauxite	—	—	5,037	4,247	[e]5,000
Beryllium: Beryl concentrate, gross weight	6	7	6	[e]6	[e]6
Bismuth	3,509	1,047	1,052	80	[e]100
Cement, hydraulic thousand tons	[3]420	450	450	450	450
Clays:					
Bentonite	250	405	361	1,112	[e]1,100
Kaolin	292	[e]300	152	200	[e]200
Coal, bituminous thousand tons	59	107	20	50	[e]50
Copper, mine output, salable ore and concentrate:					
Gross weight	1,189	1,573	590	1,303	[e]1,000
Cu content	250	291	118	260	[e]200
Feldspar	817	[e]800	67	100	[e]100
Gem stones:					
Aquamarine grams	2,246	2,400	3,600	3,600	[e]3,600
Beryl, morganite do.	28	96	50	50	[e]50
Emerald do.	3,531	4,200	5,000	5,000	[e]5,000
Garnet kilograms	1,268	1,625	1,500	11,024	[e]10,000
Tourmaline grams	1,597	6,000	1,500	1,238	[e]1,200
Lime, hydraulic[e]	10,000	10,000	10,000	10,000	10,000
Marble cubic meters	406	575	715	1,137	[e]1,100
Mica, waste[e]	[3]309	300	300	300	300
Microlite kilograms	23,000	9,900	6,283	2,649	[e]3,000
Monazite concentrate do.	[3]4,141	4,000	4,000	4,000	[e]4,000
Ornamental stones, rose quartz do.	4,911	3,600	2,500	2,500	[e]2,500
Petroleum refinery products:[e]					
Gasoline thousand 42-gallon barrels	[3]637	[3]140	175	175	175
Kerosene and jet fuel do.	[3]162	[3]23	50	50	50
Distillate fuel oil do.	[3]454	160	250	250	250
Residual fuel oil do.	[3]652	[3]487	500	500	500
Asphalt do.	[3]11	[3]25	25	25	25
Total[e] do.	[3]1,916	[3]835	1,000	1,000	1,000
Salt, marine[e]	28,000	28,000	28,000	28,000	28,000
Tantalum ores and concentrates, tantalite kilograms	13,900	6,700	4,275	2,724	[e]3,000
RWANDA[2]					
Beryllium: Beryl concentrate, gross weight	32	44	27	—	—
Columbite-tantalite, ores and concentrates, gross weight	50	52	28	—	—
Gold, mine output, Au content troy ounces	623	240	238	208	325
Tin:					
Mine output, Sn content	1,068	1,093	813	29	—
Smelter output, Sn content	1,110	1,000	800	—	—
Tungsten, mine output, W content	231	260	167	13	—
SEYCHELLES[2]					
Guano[e]	4,500	4,500	4,500	4,500	4,500

See footnotes at end of table.

Table 1.—Other countries of East Africa: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Country and commodity	1983	1984	1985	1986[p]	1987[p]
SOMALIA[2]					
Salt, marine[e]	30,000	30,000	30,000	30,000	30,000
Sepiolite, meerschaum[e]	10	10	10	10	10
SUDAN[2]					
Cement, hydraulic thousand tons	[r]200	176	140	200	122
Chromium: Chromite concentrate, gross weight[e]	20,000	20,000	8,799	8,500	13,[r]15
Gold, mine output, Au content[e] troy ounces	500	1,500	1,500	1,600	[3]2,134
Gypsum and anhydrite, crude[e]	8,000	8,000	6,400	7,000	7,000
Manganese ore[e]	400	400	400	400	400
Mica, all grades[e]	[3]10	[3]10	10	10	10
Petroleum refinery products:[e]					
Gasoline thousand 42-gallon barrels	1,000	772	1,000	1,000	1,000
Jet fuel do.	300	334	300	300	300
Distillate fuel oil do.	2,000	1,438	1,500	1,500	1,500
Residual fuel oil do.	2,000	1,600	1,500	1,500	1,500
Refinery fuel and losses do.	300	44	300	300	300
Other do.		216			
Total do.	5,600	4,394	4,600	4,600	4,600
Salt	[r]75,000	[r]75,000	38,467	[r]40,000	51,662
SWAZILAND[2]					
Asbestos: Chrysotile	26,287	25,832	25,130	20,908	25,925
Coal: Anthracite	101,852	124,569	166,179	172,145	165,317
Diamond carats		16,837	21,128	39,144	[e]85,000
Stone: Quarry product cubic meters	151,468	97,657	83,903	120,723	98,114
Tin, mine output, Sn content	5	1			
TANZANIA[2]					
Cement, hydraulic thousand tons	420	370	301	[r]300	[e]300
Clays:					
Bentonite	[3]75	[3]75	75	[e]75	[e]75
Kaolin	1,276	1,885	1,636	[r]1,600	[r]1,600
Coal, bituminous	9,996	9,722	20,000	[e]20,000	[e]20,000
Diamond[5] carats	260,374	277,352	236,000	190,000	150,000
Gem stones, precious and semiprecious excluding diamond[e 6]	[3]646	650	[3]650	650	650
Gold, refined troy ounces	[e]800	2,680	1,776	2,735	[e]3,000
Gypsum and anhydrite, crude[e]	12,000	12,000	[3]14,411	14,000	14,000
Lime, hydrated and quicklime[e]	[3]3,005	3,000	[3]2,472	3,000	3,000
Mica, sheet	[e]1	[e]1	[e]1	[e]1	[e]1
Nitrogen: N content of ammonia[e]	6,000	6,000	6,000	6,000	6,000
Petroleum refinery products:[e]					
Liquefied petroleum gas thousand 42-gallon barrels	[3]54	[3]62	80	80	80
Gasoline do.	[3]718	[3]692	800	800	800
Kerosene do.	[e]200	[3]259	220	220	220
Jet fuel do.	[3]174	[3]213	300	300	300
Distillate fuel oil do.	[3]914	[3]1,062	1,050	1,050	1,050
Residual fuel oil do.	[3]1,317	[3]1,904	1,750	1,750	1,750
Refinery fuel and losses do.	[3]290	[3]299	300	300	300
Total[e] do.	[3]3,667	[3]4,723	4,500	4,500	4,500
Phosphate minerals: Apatite	[e]20,000	14,536	15,000	10,000	18,400
Salt, all types	28,297	21,659	21,198	21,868	[e]22,000
Soda ash		298	300	[e]300	300
Tin, mine output, Sn content	6	4	2	[e]2	[e]2
UGANDA[2]					
Cement, hydraulic[e]	20,000	20,000	20,000	20,000	20,000
Lime, hydrated and quicklime[e]	[3]413	500	500	500	500
Phosphate minerals: Apatite[e]	100	100	100	100	100
Salt, evaporated[e]	5,000	5,000	5,000	5,000	5,000
Tin, mine output, Sn content	[r]18	[r e]18	[r e]18	[r e]18	10
Tungsten, mine output, W content[e]	[3]4	[3]4	4	4	4

[e]Estimated. [p]Preliminary. [r]Revised.

[1]Includes data available through Sept. 8, 1988.

[2]In addition to the commodities listed, modest quantities of unlisted varieties of crude construction materials (clays, sand and gravel, and stone) presumably are produced, but output is not reported quantitatively, and available information is inadequate to make reliable estimates of output levels.

[3]Reported figure.

[4]Less than 1/2 unit.

[5]Diamond figures are estimated to represent 70% gem-quality or semigem-quality and 30% industrial-quality stones.

[6]Exports.

COMOROS

There were no known commercially exploitable mineral deposits on the islands of the Comoros archipelago, and only small sand and gravel excavations for local construction were operated during the year. The Islands continued to rank among the world's poorest nations. The country's principal foreign-exchange earners were vanilla and cloves.

DJIBOUTI

Mineral production in Djibouti during the year was limited to locally used construction materials, evaporated salt, and a small amount of lime. The Hanle-Gaggade phase 1 geothermal project continued, with Pool-Intairdril of the United States selected to drill four exploration geothermal wells. Drilling began in December 1986 at Hanle, 50 kilometers southeast of the Ethiopian border. The wells were drilled over a 1-year period, and ranged in depth from approximately 2,300 meters to 2,500 meters. The value of the drilling contract was estimated at $6 million.[6]

The Italian company Aquater, a subsidiary of the State agency Ente Nazionale Idrocarburi (ENI) and a consultant on the geothermal project, was conducting a detailed analysis of the well data to determine the area's geothermal reserves. Potentially all of Djibouti's electrical demands could be met with geothermal energy. The total phase-1 cost, which covered both the drilling and analysis, was estimated at $16.6 million and was being funded by IDA, the Government of Italy, the African Development Bank, the Organization of Petroleum Exporting Countries Fund for International Development, and the United Nations Development Program (UNDP).

ETHIOPIA

Mineral production in Ethiopia continued to be a small part of the economy. Small amounts of gold, kaolin clay, marble, and platinum were produced for export while gypsum, limestone, marble, and salt were produced for domestic consumption. Gold was by far the major mineral export in terms of value, worth approximately $8 million[5] in revenues in 1987. All petroleum related requirements continued to be imported, with crude being refined at the country's sole refinery at Assab.

The gold activity in Ethiopia centered around the Adola placer deposits in southern Ethiopia in Sidamo Province. The Government put considerable emphasis on increasing the production of gold, with technical and equipment assistance from the U.S.S.R. The Government hoped to increase annual production to 100,000 troy ounces over the course of the next few years.

The Bureau de Recherches Géologiques et Minières (BRGM) of France and Seltrust Engineering of London, United Kingdom, completed a final feasibility study on development of the Lega Denbi gold deposits in southern Ethiopia. Based on the results of the study, development of a surface mine was under way at yearend. As part of the construction, a contract to build a 3,000-ton-per-day conventional cyanide leaching and associated processing plant was awarded to Davy McKee Corp. of Stockton, United Kingdom. Gold production was expected to begin in 1989, and startup of the processing plant was expected to begin in 1990. A $23 million credit from the African Development Bank was secured for the project in November, and another loan of approximately $25 million was being negotiated with the European Investment Bank at yearend.

Mining of marble and its use as a local building material and export commodity continued to grow in 1987. A quarrying operation for marble, granite, and limestone was developed by the Government in the Dalatti area, northwest of Mendi in western Wellega, approximately 600 kilometers from Addis Ababa. The deposits

were discovered in the late 1970's, and commercial operations began in 1981. The Ethio-Libyan Joint Mining Co., formed in 1981, was the quarry operator, owned 51% by the Government of Ethiopia and 49% by the Government of Libya. In 1985, further deposits of marble were delineated in the Mendi area, with total estimates for the area approaching 1 million tons of reserves.

Work continued on development of an open pit for potash in the Danakil Depression in northern Ethiopia, but insurgents were hampering progress. The Ethiopian-Libyan Mining Co. contracted with Entreprise Miniére et Chimique S.A. of France, to design and supervise the construction of a 1.5-million-ton-per-year open pit and beneficiation plant, based on approximately 70 million tons of proven potassium chloride reserves in the western Danakil area. Start-up was not expected until after 1990.

Table 2.—Ethiopia: Exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985	Principal destinations, 1985
Asbestos	--	4	All to Djibouti.
Cement	--	6	Do.
Copper: Metal including alloys, scrap	--	52	All to United Kingdom.
Iron and steel: Metal, semimanufactures: Bars, rods, angles, shapes, sections	5	--	
Petroleum refinery products: Residual fuel oil thousand 42-gallon barrels	1,143	1,502	Yemen (Aden) 1,028; Sudan 267; Yemen (Sanaa) 200.
Salt and brine	16,152	33,600	Malaysia 24,000; Kenya 5,000; Tanzania 4,000.

[1]Table prepared by Virginia A. Woodson. Ethiopia did not report any exports of mineral commodities to the United States during 1985.

Table 3.—Ethiopia: Imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	15	6	--	All from United Kingdom.
Metal including alloys, semimanufactures	444	348	--	Belgium-Luxembourg 143; West Germany 50; France 48.
Copper:				
Matte and speiss including cement copper	2	--		
Metal including alloys, semimanufactures	375	75	38	East Germany 10; West Germany 10.
Iron and steel: Metal:				
Scrap	640	1,296	--	Yemen (Aden) 961; Sudan 79.
Pig iron, cast iron, related materials	38	2	--	East Germany 1; U.S.S.R. 1.
Ferroalloys:				
Ferromanganese	103	--		
Unspecified	--	54	--	All from West Germany.
Steel, primary forms	6,216	8,626	--	Poland 4,747; Japan 3,483.
Semimanufactures:				
Bars, rods, angles, shapes, sections	12,291	9,627	--	Romania 2,344; West Germany 2,235; United Kingdom 2,063.
Universals, plates, sheets	31,314	19,444	36	Japan 12,365; West Germany 2,863.
Hoop and strip	2,635	3,713	--	Japan 3,583.
Rails and accessories	74	12	--	United Kingdom 4; France 3.
Wire	1,798	809	--	Republic of Korea 528; Japan 127.
Tubes, pipes, fittings	12,563	5,510	23	West Germany 1,622; U.S.S.R. 1,296; India 1,008.

See footnote at end of table.

Table 3.—Ethiopia: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985: United States	Sources, 1985: Other (principal)
METALS —Continued				
Lead:				
Oxides	4	2	--	All from United Kingdom.
Metal including alloys:				
Scrap	244	--	--	
Unwrought	26	1	--	Do.
Semimanufactures	NA	39	--	Italy 30; Japan 6.
Manganese: Oxides	100	123	--	All from Switzerland.
Mercury: 76-pound flasks	--	29	--	All from West Germany.
Nickel:				
Matte and speiss	[2]	1	--	All from Italy.
Metal including alloys:				
Scrap: value, thousands	$2	$3	--	All from Japan.
Unwrought	3	2	--	All from Italy.
Semimanufactures	266	17	--	West Germany 10; United Kingdom 5.
Silver:				
Waste and sweepings: value, thousands	--	$3	--	All from Italy.
Metal including alloys, unwrought and partly wrought: do.	$14	--		
Tin: Metal including alloys:				
Unwrought	1	--		
Semimanufactures	6	3	--	United Kingdom 2; Sweden 1.
Zinc:				
Oxides	24	47	--	All from West Germany.
Metal including alloys:				
Scrap	110	1,651	--	Japan 1,562; Belgium-Luxembourg 89.
Unwrought	1,500	17	--	All from United Kingdom.
Semimanufactures	1	90	--	All from Japan.
Other:				
Oxides and hydroxides	1,585	15	--	All from West Germany.
Base metals including alloys, all forms: value, thousands	$2	--		
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Artificial: Corundum	244	394	--	Do.
Grinding and polishing wheels and stones	102	894	--	Denmark 732; France 54.
Asbestos, crude	--	353	--	Italy 350.
Boron materials: Crude natural borates	15	--		
Cement	95,986	568	--	U.S.S.R. 292; Ireland 100.
Clays, crude	827	966	--	West Germany 910.
Diatomite and other infusorial earth	--	10	--	All from France.
Fertilizer materials:				
Crude, n.e.s.: value, thousands	$3,039	--		
Manufactured:				
Ammonia	11	6	--	All from West Germany.
Nitrogenous	15,116	29,615	--	Republic of Korea 25,200; Netherlands 2,560.
Phosphatic	23,732	500	--	West Germany 300; Belgium-Luxembourg 200.
Unspecified and mixed	36,084	28,484	--	Republic of Korea 26,250; United Kingdom 1,417.
Lime	798	8	--	All from Belgium-Luxembourg.
Magnesium compounds, unspecified	80	100	--	All from Netherlands.
Mica: Worked including agglomerated splittings: value, thousands	$1	--		
Pigments, mineral: Iron oxides and hydroxides, processed	52	--		
Salt and brine	18	11	NA	West Germany 1; unspecified 8.
Sodium compounds, n.e.s.:				
Carbonate, natural and manufactured	2,082	863	--	Kenya 500; West Germany 346.
Sulfate, manufactured	4,603	4,063	--	West Germany 2,594; Italy 826; Kenya 500.
Stone, sand and gravel:				
Dimension stone: Crude and partly worked	16	--		
Dolomite, chiefly refractory-grade	258	52	--	All from Italy.
Gravel and crushed rock	112	--		
Limestone other than dimension	300	--		
Sand other than metal-bearing	9	2	--	All from Netherlands.

See footnotes at end of table.

Table 3.—Ethiopia: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Sulfur:				
Elemental:				
Crude including native and by-product	4	19		All from West Germany.
Colloidal, precipitated, sublimed	493	1,237		West Germany 1,137.
Sulfuric acid	1,396	1,735		West Germany 776, Italy 582, U.S.S.R. 250.
Talc, steatite, soapstone, pyrophyllite	56	3		All from West Germany.
MINERAL FUELS AND RELATED MATERIALS				
Carbon black	516	144		West Germany 118, Italy 26.
Coal: Anthracite and bituminous	4	16		All from France.
Coke and semicoke	68			
Petroleum:				
Crude ... thousand 42-gallon barrels	5,261	5,456		All from U.S.S.R.
Refinery products:				
Liquefied petroleum gas 42-gallon barrels	81			
Gasoline, motor ... do	27,893	315		All from Djibouti.
Mineral jelly and wax ... do	5,194	7,927	87	Netherlands 4,966, West Germany 2,140.
Kerosene and jet fuel ... do	3,255	318		Netherlands 248, Djibouti 70.
Distillate fuel oil ... do	242,525	612		Djibouti 336, France 231.
Lubricants ... do	96,936	93,478		United Kingdom 48,097, Italy 28,665, Netherlands 11,102.
Residual fuel oil ... do	36,131	266		All from United Kingdom.

NA Not available.
[1]Table prepared by Virginia A. Woodson.
[2]Unreported quantity valued at $1,000.

KENYA

Increased international crude oil prices and depressed coffee prices combined to reverse the promising economic trends Kenya experienced in 1986, when inflation was reduced to 4.5%. Although all external debts were met in 1987, the foreign-exchange reserves of the country fell sharply, and the Government responded by imposing heavy restrictions on imports. The Kenyan trade balance for 1987 was a deficit of almost $650 million.[4]

Other than stepped-up gold exploration, there was little change in the minerals sector. Depressed international prices for most industrial minerals was the major reason for lack of activity.

Bamburi Portland Cement Co. produced over 970,000 tons of cement. Of this figure, 379,000 tons was exported, while the rest was consumed locally. Local sales increased slightly due to the startup of construction of a dam at the base of Mount Elgon; the East African Portland Cement Co. produced a record of just under 326,000 tons. The company requested Government assistance for modernizing and expanding operations to meet the Mount Elgon dam cement requirements.

Magadi Soda Co. produced slightly less than in 1987, but remained Kenya's largest supplier of salt. Its output of 37,000 tons of crude salt was approximately the same level as in recent years. Magadi operations continued to be financially hampered by yearly increases in railroad tariffs and unreliable service, mainly unavailability of locomotives.

The Kenya Fluorspar Co. (KFC) successfully produced low-phosphorus, high-quality fluorspar for the first time during late 1986, and these efforts began to pay off in 1987. Laboratory work in 1985, under contract to Robertson Research International Ltd. of the United Kingdom, resulted in the development of an economically feasible process for reducing phosphorus impurities in KFC's concentrates. The level of impurities had hindered the company's sales since startup in 1975. With a higher quality product, the company found ready markets in the United States, Western Europe, Japan, and Australia.

By the use of various reagents to depress the phosphorus mineral apatite in the flotation circuit, Robertson Research demonstrated that the phosphorus pentoxide content could be lowered to less than 0.10%. The new process included additional concentrate cleaning stages that also reduced silica and carbonate impurities. The requir-

ed changes to the plant's operations were completed in early 1987.

KFC also developed another surface mine at Cheberen in the Kerio Valley. With the additional mine, expectations for KFC's operations in 1988 were 300,000 tons of ore production and 100,000 tons of fluorspar output from the processing plant.

At yearend, gold exploration concessions were held by BRGM, Kenor of Norway, Migori Gold of Kenya, and the San Martin Co. of Switzerland. San Martin continued underground development of a mine on the quartz reef deposits of Western Kenya's Archean greenstone gold belts in the Lake Victoria Basin. Other deposits in western Kenya were being mined on the artisan level.

By yearend, the Metal Mining Agency of Japan (MMAJ) had almost completed the first phase of its project to explore for rare-earth minerals and phosphate in the Homa Bay region of Western Kenya. Initial results were reported to be very encouraging, and the second phase of the estimated 3-year project was expected to begin by mid-1988.

Gem stone exploration continued in 1987, along with mining for tsavorite, a green garnet gem stone found only in Kenya, which continued to gain international recognition.

LESOTHO

Since closure of the Letseng-la-Terai diamond mine in 1982, Lesotho's mineral production consisted solely of sand and gravel for local use. However, a major factor in the economy continued to be repatriated wages of Lesotho mineworkers in the Republic of South Africa.

MALAWI

Mineral production and exploration increased with encouraging signs for further improvement in 1988. The Portland Cement Co. of Malawi increased production about 4%, and sold it all with revenues estimated at $8 million.[7] The Kaziwiziwi coal mine increased production more than 80% in its second full year of production. It sold 18,600 tons valued at $500,000, also more than 80% higher. Further substantial production increases were expected in 1988 with explosives to be used in extracting the coal for the first time, and a rail system to replace wheelbarrows in transporting the coal out of the mine. Lime production, still small-scale, increased approximately 10%, with sales amounting to 2,580 tons at a value of $100,000. An experimental vertical kiln, built by the Government during the year, was expected to improve the quality of the lime. Testing of the kiln was to begin in 1988.

An experimental coal mine opened at Mchenga, approximately 8 kilometers southeast of Kaziwiziwi. The project was being handled by Charbonnage de France under a funding agreement between the Governments of Malawi and France. By the yearend two adits had been driven next to the 1.5-meter-thick seam of interest, and exploratory drilling cores in from the adit were used to estimate a reserve of 1.1 million tons of coal. At yearend, all mining equipment had been installed, and limited mining activities were expected in 1988.

As a followup phase to geological mapping by BRGM and the Malawi Geological Survey Department (GSD), drilling began in the Mwabvi Coalfield of the Nsanje District. By yearend, eight exploration drill holes had been completed. Results showed thick coal seams near the surface, and at moderate depths. Geological mapping by RGM and GSD was also carried out on the North Rukuru and Nthalire Basins in the Chitipa District. A comprehensive exploration drilling program was being planned for North Rukuru, which was estimated to have the potential for the largest coal reserves in Malawi.

Paterson, Grant, and Watson of Toronto, Canada, completed their evaluation of the UNDP funded airborne geophysical survey completed in 1986. Interpretation of the results show a lot of mineralized areas with good potential for base metals, gold, the platinum-group metals, industrial minerals, and radioactive minerals.

MMAJ and the Japan International Cooperation Agency completed the second phase of an exploration of the Tundulu and Songwe carbonatite complexes. Thirty-five drill holes had been completed by the end of the phase, along with sampling from five trenches. Results of the drilling had not been made public by yearend. Phase 3 was to begin in mid-1988.

MAURITIUS

Mauritius continued to advance as a developing country, with a gross domestic product (GDP) of $1.3 billion[e] in 1987. The economy grew by an estimated 7% for the third consecutive year of strong growth. Mineral production comprised only small amounts of salt and lime, along with some sand, gravel, and stone for construction. For the second year since 1974, Mauritius recorded a trade balance surplus, owing mainly to increasing exports of manufactures. Although sugar was the most important export, the manufacturing sector accounted for more than one-half of all export revenues.

MOZAMBIQUE

In January 1987, the Government of Mozambique adopted a Program for Economic Rehabilitation, which included dismantling the country's centralized economic system and replacing it where possible with private control. As part of this plan, large state-run collective farms were returned to private hands during the year. Agriculture employed more than 85% of the work force.

Mozambique's GDP increased almost 20% to about $4.7 billion. However, most balance of payment indicators showed increased deficits, and the country's foreign debt increased about 14% to about $3.6 billion. As in recent years, the country's economy and its ability to attract foreign investors were severely hampered by the insurgency.

A U.S. Government-funded study in 1987 evaluated the economic potential of a number of minerals in Mozambique, including ilmenite, nickel, chromite, cobalt, beryllium, tantalum, rare earths, manganese, platinum, bauxite, graphite, marble, diatomite, bentonite, fluorspar, coal, and natural gas. It was felt that ilmenite (sands) and diatomite showed the best near-term development potential.

Coal output improved dramatically, although the production potential appeared to be very much higher. The Mozambique Government was seeking aid from the German Democratic Republic and the U.S.S.R. to rehabilitate the five existing mines at Moatize. These mines had a combined capacity of 800,000 tons per year. Two new opencast mines were planned for Moatize and described in a preliminary study. These could boost coal production to 6 million tons per year. Because of problems related to the continuing insurgency, including the cutting of the railroad line to the port of Beira, 200,000 tons of coal was stockpiled at yearend. Coal reserves at Moatize were estimated to be 2 billion tons, with an additional 1.5 billion tons estimated in the nearby Sananggoe Basin.

Kenmare Resources PLC (KRPLC) of Dublin, Ireland, and the Geological Survey of Yugoslavia (GEO) signed 50-50 joint-venture agreement to develop a titaniferous mineral sand deposit between the towns of Angoche and Sangage on the northeastern coastline. The deposit was discovered by GEO in the early 1980's, and a 5-year sampling program, including exploration drilling, delineated proven reserves along a 4.5-kilometer strip of 28 million tons of ore grading 8% economic heavy minerals. Concentrates graded 84% ilmenite, 8% titanomagnetite, 4% zircon, 3% rutile, and 1% monazite. Metallurgical testing was under way at yearend, and final results were expected to be reported in early 1988. Preliminary findings indicated a potential recovery rate of between 85% and 90%. Further drilling and engineering studies were under way at yearend, to be completed in early 1988. Given favorable results, commercial production could begin as early as 1989, with KRPLC the operator-manager.

Edlow Resources, a Bermuda-registered company from the United States, began prospecting for titaniferous beach sands in a 200-kilometer-long concession in Zambezia and Nampula Provinces, between Raraga and Moma. Substantial reserves were already known to exist, and Edlow was looking for additional reserves and more information on specific locations. The concession agreement was for 27 years, and the initial project cost was estimated at $20 million. Production could be as early as 1990.

A contract was signed with Lonrho Ltd. of the United Kingdom for exploration and development of gold deposits in Manica Province. Investments by Lonrho in 1987 totaled $2 million.

The Esso Petroleum Co. and Shell Exploration Co. partnership continued its petroleum exploration drilling in Cabo Delgado Province; however, no discovery announcements were made. British Petroleum Co.

signed an agreement in September to spend $31 million in exploration drilling in 1988 and 1989.

REUNION

Mineral activities on the island were limited to small sand and gravel operations for local construction, and operation of a 200,000-ton-per-year year cement clinker grinding plant at Saint-Denis, which manufactured cement mix from imported materials. Réunion, an island of approximately 2,500 square kilometers, had a population of approximately 550,000 in 1987 and remained an overseas department of France.

Table 4.—Réunion: Exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1985	1986	Destinations (principal), 1986
METALS			
Aluminum: Metal including alloys:			
Scrap	43	58	France 49; Madagascar 9.
Semimanufactures value, thousands	--	$3	Comoros $1; Mauritius $1.
Copper: Metal including alloys:			
Scrap	138	164	All to France.
Semimanufactures value, thousands	$1	$2	Comoros $1; Madagascar $1.
Iron and steel: Metal:			
Scrap	2,716	271	Italy 258; France 13.
Semimanufactures:			
Bars, rods, angles, shapes, sections	86	141	Comoros 88; Madagascar 52.
Universals, plates, sheets	90	921	Comoros 471; France 249.
Hoop and strip	1	--	
Rails and accessories	--	1	All to Comoros.
Wire	3	1	Do.
Tubes, pipes, fittings	75	153	Madagascar 106; Comoros 46.
Castings and forgings, rough	1	16	All to France.
Silver: Metal including alloys, unwrought and partly wrought value, thousands	--	$4	Do.
Titanium: Oxides	--	3	All to Madagascar.
INDUSTRIAL MINERALS			
Cement	4	21	Madagascar 20.
Clays, crude	--	46	All to Madagascar.
Fertilizer materials: Manufactured:			
Ammonia	--	2	All to Republic of South Africa.
Nitrogenous	3	--	
Phosphatic	--	2	All to Comoros.
Unspecified and mixed	6	--	
Sulfur:			
Elemental, crude including native and byproduct value, thousands	$1	--	
Sulfuric acid	4	--	
MINERAL FUELS AND RELATED MATERIALS			
Petroleum refinery products:			
Liquefied petroleum gas 42-gallon barrels	731	766	Do.
Mineral jelly and wax do.	--	126	All to Republic of South Africa.
Kerosene and jet fuel do.	--	62	NA.
Distillate fuel oil do.	112	--	
Lubricants do.	511	875	Comoros 777; Madagascar 63.
Residual fuel oil do.	40	--	

NA Not available.

[1]Table prepared by Virginia A. Woodson. Réunion did not report any exports of mineral commodities to the United States during 1986.

Table 5.—Réunion: Imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1985	1986	Sources, 1986	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals value, thousands	$2	$1	--	All from France.
Aluminum:				
Oxides and hydroxides do.	$1	$7	--	Do.
Metal including alloys, semimanufactures	225	249	--	France 226; Belgium-Luxembourg 14.
Chromium: Oxides and hydroxides	4	--		
Copper: Metal including alloys:				
Unwrought	2	--		
Semimanufactures	257	$10	--	France 300.
Iron and steel: Metal:				
Pig iron, cast iron, related materials	5	5	--	All from France.
Semimanufactures:				
Bars, rods, angles, shapes, sections	18,422	28,342	--	Republic of South Africa 11,984; Spain 7,649; France 4,562.
Universals, plates, sheets	18,708	17,025	--	France 12,263; Republic of South Africa 2,608.
Hoop and strip	39	38	--	All from France.
Rails and accessories	652	21	--	Do.
Wire	624	778	--	Republic of South Africa 381; France 257.
Tubes, pipes, fittings	8,223	11,242	--	France 7,297; Republic of South Africa 2,675.
Castings and forgings, rough	398	522	--	France 434; Belgium-Luxembourg 88.
Lead:				
Oxides	9	7	--	All from France.
Metal including alloys, semimanufactures	11	5	--	Do.
Mercury value, thousands	$2	--		
Nickel: Metal including alloys:				
Unwrought do.	--	$1	--	Do.
Semimanufactures do.	$36	$1	--	All from West Germany.
Silver:				
Waste and sweepings do.	--	$2	--	Do.
Metal including alloys, unwrought and partly wrought do.	$7	$19	--	Do.
Tin: Metal including alloys:				
Scrap do.	$1	--		
Semimanufactures	1	2	--	All from France.
Titanium: Oxides	379	392	--	Do.
Zinc:				
Oxides	8	7	--	Do.
Metal including alloys:				
Unwrought	1	1	--	Mainly from France.
Semimanufactures	8	28	--	All from France.
Other: Oxides and hydroxides	--	898	--	All from Kenya.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	1	10	--	Mainly from France.
Grinding and polishing wheels and stones	39	38	--	France 35.
Asbestos, crude	4	11	--	United Kingdom 6; France 4.
Barite and witherite	220	60	--	All from France.
Boron materials: Oxides and acids	--	1	--	Do.
Cement	248,661	222,462	--	Kenya 128,627; Republic of South Africa 53,546.
Chalk	2,072	1,727	--	France 1,212; Mauritius 515.
Clays, crude	553	35	--	All from France.
Diamond: Gem, not set or strung value, thousands	$13	$27	--	France $19; India $7.
Diatomite and other infusorial earth	25	58	--	All from France.
Fertilizer materials: Manufactured:				
Ammonia	11	8	--	France 5; Belgium-Luxembourg 3.

See footnote at end of table.

Table 5.—Réunion: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1985	1986	Sources, 1986	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Fertilizer materials: Manufactured —Continued				
Nitrogenous	2,495	5,074	--	Italy 3,275; Belgium-Luxembourg 974.
Phosphatic	279	33	--	Republic of South Africa 18; France 15.
Potassic	249	3,701	(2)	Jordan 3,600.
Unspecified and mixed	29,765	24,863	--	France 8,278; Mauritius 8,078; Italy 7,000.
Gypsum and plaster	7,730	10,151	--	All from France.
Lime	1,784	1,467	--	Kenya 757; Mauritius 358; France 272.
Magnesium compounds, unspecified	154	35	--	All from Netherlands.
Mica: Crude including splittings and waste	13	21	--	All from France.
Phosphates, crude	--	768	--	All from Republic of South Africa.
Pigments, mineral: Iron oxides and hydroxides, processed	62	33	--	France 17; West Germany 16.
Precious and semiprecious stones other than diamond: Natural value, thousands	$29	$33	--	India $12; Hong Kong $9; France $8.
Salt and brine	2,224	3,495	--	West Germany 1,597; Madagascar 1,236.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	18	10	--	All from France.
Sulfate, manufactured	478	491	--	France 481; Italy 10.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	--	42	--	All from Italy.
Worked	399	484	--	France 409; Italy 68.
Gravel and crushed rock	2	49	--	All from France.
Quartz and quartzite	4	7	--	Do.
Sand other than metal-bearing	29	16	--	Do.
Sulfur:				
Elemental: Crude including native and byproduct	--	1	--	Do.
Sulfuric acid	129	99	--	France 78; West Germany 21.
Talc, steatite, soapstone, pyrophyllite	60	5	--	All from France.
Other:				
Crude	66	131	--	Do.
Slag and dross, not metal-bearing	1	--		
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	22	20	--	All from Republic of South Africa.
Carbon black	3	1	--	All from France.
Coal	2	1	--	Do.
Peat including briquets and litter	1	22	--	West Germany 19; France 3.
Petroleum refinery products:				
Liquefied petroleum gas thousand 42-gallon barrels	183	--		
Gasoline, motor do.	807	965	--	Bahrain 924; United Arab Emirates 31.
Mineral jelly and wax do.	(3)	--		
Kerosene and jet fuel do.	380	391	--	Bahrain 359; Yemen (Aden) 32.
Distillate fuel oil do.	516	629	--	Bahrain 612.
Lubricants do.	23	30	(3)	France 15; Republic of South Africa 10.
Residual fuel oil do.	65	115	--	United Arab Emirates 54; Tanzania 39.
Bitumen and other residues do.	47	--		
Bituminous mixtures do.	1	1	--	Mainly from France.

[1]Table prepared by Virginia A. Woodson.
[2]Unreported quantity valued at $3,000.
[3]Less than 1/2 unit.

RWANDA

Rwanda was the most densely populated country in Africa, with a population slightly over 6.3 million and land area slightly smaller than Belgium. It was heavily dependent on agriculture for subsistence and foreign exchange. Coffee and tea were the major foreign-exchange earners with coffee accounting for approximately 70% of all export revenues. Rwanda's sole mineral agency, Société Minière du Rwanda (SOMIRWA), went into receivership in September 1985. The Government was making

strenuous efforts to reorganize the industry, and international agencies including the International Monetary Fund (IMF) were investigating possible solutions.

SEYCHELLES

The only mineral-related operations on the islands of Seychelles remained small sand and gravel pits for local construction, and collection and processing of guano for fertilizer.

SOMALIA

The only mineral produced in Somalia for commercial export was sepiolite (meerschaum). For local consumption, salt was produced from coastal evaporation pans and limestone for cement was quarried at Berbera. Roads were poor, and there was no railroad system.

Somalia's external debt at the end of 1987 was approximately $2 billion.[9] The Government was unable to pay even the interest on this debt during the year, and at the Paris Club meeting held in July, the country's debts were rescheduled. Somalia's trade deficit for 1987 was estimated at $400 million.

To boost both private and foreign participation in the Somalian economy, a new foreign investment law was enacted in July. The law was to allow both profits and salaries originating from a registered investment to be transferred abroad. Profits reinvested could be transferred abroad after 5 years. Up to 50% of the salaries, wages, or gratuities of foreign personnel could be transferred out of the country.

There was substantial interest in petroleum exploration Somalia in 1987 by several international oil companies. Amoco Somali Petroleum Co. signed an agreement for an 8.6-million-acre onshore concession covering three contiguous tracts spanning from north to southwest of the capital city of Mogadishu. The agreement was for a 3-year period, with three 1-year extensions possible. Aeromagnetic, gravity, and seismic field studies began in August.

Amoco also signed an agreement with Consolidated International Petroleum and Gulf Stream Resources for one-half-interest in a 4-million-acre concession on the northeast coast. At least one well was to be drilled in the concession during 1988. Chevron Oil Co. of the United States was preparing a drilling site at yearend in its northern concession near Zeila, on the Gulf of Aden coastline. Drilling was expected to begin in February 1988.

SUDAN

Sudan's economy continued to be in trouble in 1987. Standing at approximately $14 billion[10] at yearend, the country's external debt was 1.5 times its GDP. One-third of worldwide overdue payments to the IMF were Sudan's. The Government had defaulted on paying even the interest on IMF loans since 1985. In August, the Government reached a 1-year emergency agreement with the IMF, and in October the Minister of Finance announced the formal adoption of a reform program. The reforms included devaluing the Sudanese pound 40%, increasing local taxes and the prices of staples, changes in the Islamic banking practices, and a 4-year program to decrease Government regulation and enhance opportunities for private and foreign investment.

Mining activities in Sudan included small-scale chromite operations, salt from coastal evaporation pans, limestone for cement as well as other small amounts of industrial minerals for construction purposes, and gold. The gold production continued to expand during the year and was proving to be a profitable activity for mining firms and the Government alike.

The Gebeit gold mine in Sudan's Red Sea Hills was officially commissioned in November. Minex Developments operated the mine on behalf of its parent company, Greenwich Resources Ltd. of the United Kingdom, which owned 49% of the operation. The Government of Sudan owned the rest. Between the start of experimental mining at Geibeit in June 1983 and the end of 1986, more than 3,200 ounces of gold were produced. Much of the production came from leaching surface piles since the underground operations did not begin until the

latter part of 1987. Operations were being conducted from an existing 45° inclined shaft. The shaft was rehabilitated and deepened from 70 meters to 140 meters. Plans were to extend the shaft an additional 120 meters to facilitate mining.

The capacity of the mine's vat leaching operation was increased from 100 tons per day to 300 tons per day. The processing plant was essentially completed during the year, by GEC Mechanical Handling of the United Kingdom, and comprised crushing, grinding, gravity separation, flotation, leaching, and smelting components.

Production in 1988 was expected to average approximately 100 ounces per day, and that rate was expected to double by 1992. Reserve figures in 1987 for Gebeit were put at 400,000 tons with an average grade of 15.9 grams per ton.

Gebeit was not the only gold mine in operation in 1987. In northeast Sudan BRGM and Total Cie. Miniére poured their first gold on March 1, 1987, at their Hassai Mining operation. Development of Hassai began in early 1986 and continued throughout 1987. Commissioning of the mine was expected at yearend 1988. The gold reserve estimates for Hassai at yearend 1987 were 405,000 ounces. Exploration was to continue in 1988, with prospecting attention to be focused on the Ginyat, Kiniwaip, and Nijaim areas.

SWAZILAND

Mining in Swaziland accounted for approximately 3% of the country's GDP in 1987. Revenues from minerals were derived primarily from asbestos and coal mining, and from a small diamond mine that was in its third full year of operation. Although diamond production was not officially reported, sharp revenue increases indicated a significant increase in output from the Dvokolwayo Mine. Asbestos remained the largest source of mineral revenue, although coal mining was regarded as the mineral product with the greatest long-term potential.

Mineral export revenues increased to $19.6 million,[11] which represented an increase of 11% in local currency and 26% in U.S. dollar terms, allowing for a 10.6% depreciation of the emalengeni against the dollar in 1987. Asbestos revenues were $10.2 million, up 13% in dollar terms; diamond revenues were $1.8 million, up 27%, and coal revenues declined 17% to $3.2 million. Production of stone for commercial use decreased almost 20%, with a corresponding decrease in sales revenues to $0.8 million. The total work force in Swaziland's mineral industry was 2,380, a slight decrease from the previous year. One-half were involved in surface mining.

The Havelock asbestos mine experienced a difficult year, due mainly to declining reserves. Tonnage of ore milled declined 7% to about 729,500 tons; however, the use of surface stockpiles allowed the mine to increase its production of chrysotile fiber by almost 25%. Asbestos sales, mostly for export, increased 11% to about 25,400 tons. The Republic of South Africa remained the main export market in 1987, receiving 10,500 tons of fiber worth $21 million. Other major markets were Japan, France, and Thailand.

Throughout the year mining problems occurred in the underground asbestos workings due to greater dilution of the ore body and a significant drop in recovery of longer, better quality fiber ore. Heavy ground conditions and equipment breakdowns contributed to a significant increase in operating costs. As a result of financial losses in 1987, a plan was submitted to the Government in September to revise mining operations to make the mine economically viable in 1988. The plan agreed to at yearend would lower mine production to 600,000 tons of ore per year and decrease the work force by almost 25% (approximately 450 workers). A review of the industry by the American Embassy in Mbabane indicated that even with the development of new asbestos deposits to the west of the Havelock Mine, economically viable asbestos reserves may be exhausted within 5 years.

Production of coal decreased slightly from Swaziland's sole operation, the Mpaka Mine in the eastern Lowveld area. Sales rose 6% to 187,000 tons for the year. Export sales were up 3% to 157,000 tons. However, depressed international market prices resulted in a 17% drop in revenues in dollar terms, from a record $3.9 million in 1986. The main export market remained the Bamburi cement works in Kenya, which increased orders from 65,000 tons in 1986 to 109,000 tons in 1987. Exports of coal to the Republic of Korea for briquetting amounted to 47,800 tons, a substantial decrease from the 90,000 tons bought in 1986. All coal shipments were through the port of Mapu-

to, Mozambique.

Negotiations on the proposed construction of a 60,000-ton-per-year ferrochrome plant in Swaziland were at a stalemate over Swazi Chrome's request to the Republic of South Africa to supply additional electricity to run the plant. Several gold exploration agreements, including one with Rio Tinto Zinc Corp. were signed to examine the gold potential of the Pigg's Peak and Nhlangano regions.

Following an alleged scandal involving the Minerals Committee, the King of Swaziland appointed a new seven-member Minerals Committee along with a special minerals negotiating committee to oversee all agreements and conditions.

TANZANIA

Agriculture contributed 80% of the country's foreign-exchange earnings, 90% of its employment, and 40% of its GDP for 1987. As part of a 3-year recovery program under way, the U.S. Agency for International Development provided $46 million[12] toward rehabilitating the country's Tazara Railroad (Dar es Salaam, Zambia). New locomotives and spare parts were badly needed by the railroad, as well as a major overhaul of equipment and shops to maintain the rail line system. For the rehabilitation of Dar es Salaam's ocean port, a donation of copper handling equipment was made to the port authorities by the Swedish International Development Agency. The new equipment was expected to expedite Zambian copper exports, which were first rerouted through Dar es Salaam in December 1986. The copper handling equipment was valued at $2 million.

To reduce smuggling, the Government increased the allowable retention of foreign exchange earnings from gold and gem stone mining by artisans from 50% to 70% of the sale value to the government. Several thousand prospectors were estimated to be operating in the northern Shinyanga area, where they could illegally receive as much as 10 times the official rate for gold.

The exploration concession of the Geneva-based Dar Tadine Tanzania (DTT) expired in November, completing a 3-year project that accomplished little of the originally proposed $25 million program. Only gold buying and an unsuccessful heap-leaching operation of old tailing piles were attempted by DTT over the life of the project. A commission of inquiry was to be formed by the Government in 1988 to investigate the failed project. Parliament officials were critical of the program's results, particularly in light of the fact that DTT was given five attractive concessions covering 7,000 square kilometers near Lake Victoria for gold exploration. DTT suspended the Buhemba static leach operation of small gold-tailing piles in mid-1986 because of poor recoveries.

The Kiwira coal mine was being developed throughout the year and was expected to begin commercial operations in October 1988. The coal project was a Chinese aid program estimated to cost $7.23 million. The mine was to be operated by Kiwira Coal Mining Co., a subsidiary of Tanzania's State Mining Co. (STAMICO). Initial production for the mine was to be 150,000 tons per year, rising to 600,000 tons per year. The coal was to be used for both domestic and industrial purposes and eventually for a proposed 6 megawatt power station to be built at Keyela.

The Williamson Diamond Mines Ltd. continued to be plagued by a lack of equipment and spare parts. Production continued to decline and was estimated to be 150,000 carats in 1987, a record low for the 26-year-old operation. The operation was owned 50-50 by the Government and private owners. The operation had a record-high production in 1966 of 925,000 carats. In 1987, approximately 2.7 million tons of ore was mined and processed at Mwasdui, while the target for the year was 3.3 million tons. The recovered ore grade of 6.3 carats per 100 tons was almost 25% less than expected. Williamson's new Alamasi Mine contributed 25,000 tons of ore in 1987.

UGANDA

As in many recent years, the Ugandan economy struggled throughout 1987. Although civil security improved, the economy further declined. The rate of decline had leveled off by midyear and was expected to reverse itself in 1988. In June 1987, the

Government recalled the currency and issued new banknotes and coins. One new shilling was issued for 100 old shillings, and there was a 30% conversion tax. Part of the reason for issuing the new currency that the old Ugandan shilling was so devalued that it was practically worthless.

The rate of inflation rose during the year, but declined to 200% by yearend. In June, the Paris Club rescheduled $60 million[12] in debts due for settlement during the year and pledged $800 million towards rehabilitation and development for Uganda. The Ugandan external debt was $1.2 billion at yearend.

For the ninth consecutive year, the Kilembe copper mine remained on a care-and-maintenance basis. Negotiations with North Korea were under way at yearend for technical and financial assistance to rehabilitate the operation. Part of the proposed rehabilitation was the construction of a foundry at Kilembe large enough to produce equipment and spare parts for all of Uganda's mining industry. The same foundry would supply the cement plants at Hima with spare parts.

The project would also involve the construction of a copper smelter, cobalt recovery plant, and sulfuric acid plant complex. All were to be built at Kasese where an estimated 1.1 million tons of cobalt pyrite concentrates from the mine were stockpiled during the 1970's. The cost of the three plants was estimated at $25 million and the cost of rehabilitating the mine $20 million. The Ministry of Minerals and Water Development estimated that 2,400 tons of cobalt carbonate per year could be produced from the stockpile, while slightly over 100,000 tons of 98% sulfuric acid per year could be produced. The acid production was expected to be shipped to Tororo for use in the manufacture of phosphate fertilizers from local reserves of apatite and pyrochlore ore. The EEC also extended credit during the year for renovation of the Nkombe sawmill, which supplies hardwood as well as timber for underground support at the Kilembe Mine.

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[1]Physical scientist, Division of International Minerals.

[2]Where necessary, values have been converted from Burundi francs (FBu) to U.S. dollars at a rate of FBu125.00 = US$1.00.

[3]Mining Annual Review. Min. Mag., Aug. 1987.

[4]Where necessary, values have been converted from Djibouti francs (DF) to U.S. dollars at the rate of DF180.00 = US$1.00.

[5]Where necessary, values have been converted from Ethiopian birr (EB) to U.S. dollars at the rate of EB2.07 = US$1.00.

[6]Where necessary, values have been converted from Kenyan shillings (K Sh) to U.S. dollars at the rate of K Sh16.30 = US$1.00.

[7]Where necessary, values have been converted from Malawian kwacha (MK) to U.S. dollars at the rate of MK2.20.00 = US$1.00.

[8]Where necessary, values have been converted from Mozambican meticais (M) to U.S. dollars at the rate of M300.00 = US$1.00.

[9]Where necessary, values have been converted from Somali shillings (So.Sh) to U.S. dollars at the rate of So.Sh100.00 = US$1.00.

[10]Where necessary, values have been converted from Sudanese pounds (Sd) to U.S. dollars at the rate of Sd 4.50 = US$1.00.

[11]Where necessary, values have been converted from Swazi emalangeni (E) to U.S. dollars at the rate of E2.03 = US$1.00 for 1987 and E2.27 = US$1.00 for 1986. (NOTE: This is a correction of conversion rate inadvertently used in 1986 Minerals Yearbook.)

[12]Where necessary, values have been converted from Tanzanian shillings (TSh) to U.S. dollars at the rate of TSh65.00 = $1.00.

[13]Where necessary, values have been converted from Ugandan shillings (USh) to U.S. dollars at the rate of USh60.00 = US$1.00.

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